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REMARKS

Claims 1, 4, and 10-28 are all the claims presently pending in the application. Claims 1 and 4 stand rejected on prior art grounds. This Amendment amends claims 1 and 4 and cancels non-elected claims 2, 3, and 5-9. Claims 10-28 were added to claim additional features of the invention. Attached hereto is a marked-up version of the changes made to the claims by the current Amendment.

It is noted that the claim amendments are made to merely clarify the language of each claim, and not for distinguishing the invention over the prior art, narrowing the claims, or for any statutory requirements of patentability. It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Regarding the prior art rejection, claims 1 and 4 stand rejected under 35 U.S.C. §102(b) as being anticipated by Dragone (U.S. Patent No. 5,002,350).

The rejection is respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

Applicant's invention, as disclosed and defined in claim 1, is directed to an arrayed waveguide grating that includes a substrate, a first channel waveguide disposed on the substrate, a parabolized channel waveguide array disposed on the substrate and constituted such that each length of parabolized waveguides in the parabolized channel waveguide array is sequentially longer with a predetermined difference between the lengths of the waveguides. The invention further includes a first slab waveguide disposed on the substrate and connecting the first channel waveguide with the channel waveguide array, a second slab

waveguide disposed on the substrate and connecting an end of the channel waveguide array on the side wherein the first slab waveguide has not been connected thereto with an end thereof, a second channel waveguide disposed on the substrate and connected to the other end of the second slab waveguide, and a parabolic waveguide part connected to the second channel waveguide.

As a result, problems with a parabolic loss characteristic due to sudden changes in output levels and modulation problems due to narrowed transmission widths in the case of connected arrayed waveguide gratings are reduced (Application, p. 2, lines 25-29).

In complete contrast, a conventional arrayed waveguide grating repeats loss characteristics with respect to optical frequency and exhibits a more precipitous parabolic configuration in the vicinity of the central frequency. Thus, communications problems emerge where a wavelength of a laser light source deviates from its central frequency and optical modulation components are easily cut off (e.g., see specification, p. 3, lines 15-25).

The claimed invention, however, uses a design of the a parabolized channel waveguide array disposed on substrate and to prevent parabolic loss of the transmission signal in an arrayed waveguide grating.

II. THE PRIOR ART REJECTIONS

THE DRAGONE REFERENCE

The Examiner alleges that claims 1 and 4 are anticipated by Dragone under 35 U.S.C. § 102(b). Applicant submits, however, that there are elements of claims 1 and 4 which are neither taught nor suggested by Dragone.

Dragone discloses an optical multiplexer/demultiplexer that includes an exemplary

embodiment of eleven waveguides arranged into four waveguide arrays, each of which defines a substantially circular arc. The arc, formed by a waveguide array, is part of a circle which has its center along one end of a waveguide array (col. 2, lines 13-21). The waveguides are each of a different length, and each differs in length from its adjacent waveguide by a fixed amount (col. 2, lines 49-51). Dragone also discloses a tapered part at the end of each waveguide. (col. 5, lines 10-15).

The Examiner alleges that column 2, lines 48-50 and reference numerals 101-105 of Figure 1 of Dragone teach a channel waveguide array disposed on substrate and constituted such that each of the waveguides in the array is sequentially longer with a predetermined difference in the lengths of the waveguides. However, these passages merely disclose a channel waveguide array structure essentially similar to the waveguide array disclosed as conventional art of the present Application. A conventional channel waveguide array 14 is curved entirely in a U-shaped structure between a first sector form slab waveguide 15 and a second sector form slab waveguide 16 (Application, p. 2, lines 6-10; Fig. 1).

Dragone has no teaching or suggestion of "a parabolized channel waveguide array disposed on said substrate and constituted such that each length of parabolized waveguides in the parabolized channel waveguide array is sequentially longer," as recited in claim 1.

In a non-limiting exemplary embodiment, parabolized channel waveguide array 135 of the present invention is illustrated in Figure 5. The individual waveguides form parabolic curves between first sector form slab waveguide 136 and second sector form slab waveguide 137. In contrast, Dragone's channel waveguides 101-105 are curved entirely in a conventional U-shaped structure.

Dragone's U-shaped waveguide structure significantly increases a parabolic loss

characteristic in the vicinity of a central optical frequency in each of the waveguides when a wavelength of a laser light source deviates from its central optical frequency due harmful effects such as temperature change (Application, p. 2, lines 25-29 to p.3, lines 1-5).

In an exemplary embodiment, the parabolized channel waveguide array preferably causes transmission characteristics exhibiting flat peak levels with respect to optimal frequency. Such a parabolized structure prevents a sudden change in an output level due to such temperature change. Where multiple arrayed waveguide gratings are connected, the parabolized waveguide channel prevents cutting in modulation components because of a narrowed transmission width (Application, p. 3, lines 1-10).

The Examiner further alleges column 4, line 9 to column 7, line 3 of Dragone teaches a second channel waveguide disposed on said substrate and connected to the other end of said second slab waveguide wherein a waveguide part in the connected area has a parabolic configuration. However, Dragone discloses that a connection portion of a second channel waveguide merely has curved portions, which is not a true parabolic configuration. Dragone does not teach or suggest "a waveguide part in the connected area has a parabolic configuration," as recited in claim 1 (emphasis Applicant's).

In an non-limiting exemplary embodiment of the present invention, each of the connection portions of the second channel waveguide (which correspond to connection portions of waveguides 106 to 108 of waveguide array 112 and waveguides 109 to 111 of waveguide 114 of Dragone) has a parabolic configuration (See parabolic configured waveguide part 151 in Figs. 7 and 8). On the contrary, Dragone fails to teach or suggest that the configuration of waveguides 101 to 105 of waveguide arrays 115 and 113 are configured as parabolic.

Figures 1 and 2 of Dragone show the connection portions 106-111 having curved shapes. In referring to the connection portions in Figure 2, Dragone states "L is equal to the tapered region" (col. 5, line 39) (emphasis Applicant's). Dragone forms a tapered configuration for waveguide parts 106-111. The geometrical difference between the connection portions of Dragone and the waveguide parts of the claimed invention is clear from the differences between equation (1) on page 21 of the present Application and equation (1) in column 2 of Dragone. Therefore, contrary to the Examiner's assertions, Dragone fails to teach or suggest a connection portion of a second channel waveguide having a parabolic configuration.

The present invention teaches a true parabolic configuration for the waveguide part. This is an important feature of the claimed invention because the parabolic configuration of the waveguide part is provided for realizing flat optical characteristics. Thus, Dragone fails to teach or suggest "a waveguide part in the connected area comprises a parabolic configuration," as recited in claim 1 (emphasis Applicant's).

Regarding the rejection to claim 4, the Examiner alleges that column 4, line 9 continuing to column 7, line 3 of Dragone teaches the claim 4 elements of the parabolic configuration as individually adjusted in response to respective wavelengths of multiplexed optical signals input to a first channel waveguide. However, these passages of Dragone merely disclose that the configurations of connection portions of waveguides 101 to 105 of waveguide arrays 115 and 113 are individually adjusted. Thus, there is no teaching or suggestion in Dragone of "said waveguide part parabolic configuration is individually adjusted," as recited in claim 4 (emphasis Applicant's).

In other words, in the claimed invention, the configuration of the connection portions

(corresponding to connection portions of waveguides 106 to 108 of waveguide array 112 and waveguides 109 to 111 of waveguide array 114) is individually adjusted, not the channel waveguide array.

Further, Dragone specifically discloses determining the refractive profile of an arc formed by each waveguide array (see Fig.2) at closely spaced intervals along the longitudinal axes of the waveguides to uniquely determine the dimensions of a taper (col. 5, lines 10-15). This is a different technique for a different aim than taught in the present invention. Again, the claimed invention does claim a tapered waveguide, and Dragone does not teach or suggest a waveguide part having a parabolic configuration.

Thus, turning to the exemplary language of claim 1, there is no teaching or suggestion of "An arrayed waveguide grating, comprising:

a substrate;

a first channel waveguide disposed on the substrate;

a parabolized channel waveguide array disposed on said substrate and constituted such that each length of parabolized waveguides in the parabolized channel waveguide array is sequentially longer with a predetermined difference between the lengths of the waveguides;

a first slab waveguide disposed on said substrate and connecting said first channel waveguide with said channel waveguide array;

a second slab waveguide disposed on said substrate and connecting an end of said channel waveguide array on the side wherein said first slab waveguide has not been connected thereto with an end thereof; and

a second channel waveguide disposed on said substrate and connected to the other

end of said second slab waveguide wherein a waveguide part in the connected area has a parabolic configuration," (emphasis Applicant's).

For at least the reasons stated above, Applicant respectfully submits that the cited references fail to teach or suggest every feature of independent claim 1. Applicant submits that claim 4 is patentable not only by virtue of dependency from independent claim 1 but also by the additional limitations it recites.

Based on the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejection.

III. INFORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1,4, and 10-28, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to withdraw the rejection and pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner may contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

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The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorneys Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 5/19/03

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CERTIFICATION OF TRANSMISSION

I certify that I transmitted via facsimile (703) 872-9318 (Official Facsimile Number for Technology Center TC2800, Before Final FAX) this Amendment to the Examiner Krystyna Suchecki on May 19, 2003.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend claim 1, as follows:

1. (Amended) An arrayed waveguide grating, comprising:

a substrate;

a first channel waveguide disposed on the substrate;

a parabolized channel waveguide array disposed on said substrate and constituted [in] such that each length of parabolized waveguides in the parabolized channel waveguide array is sequentially longer with a predetermined difference [is] between the lengths of the waveguides;

a first slab waveguide disposed on said substrate and connecting said first channel waveguide with said parabolized channel waveguide array;

a second slab waveguide disposed on said substrate and connecting an end of said channel waveguide array on the side wherein said first slab waveguide has not been connected thereto with an end thereof; and

a second channel waveguide disposed on said substrate and connected to the other end of said second slab waveguide wherein a waveguide part in the connected area has a parabolic configuration.

4. (Amended) An arrayed waveguide grating as claimed in claim 1, wherein[:] said waveguide part parabolic configuration is individually adjusted in response to respective wavelengths of multiplexed optical signals input to said first channel waveguide.